

CLAIMS

1. A gas sensor comprising a cavity for containing a gas;
means for generating radiation which is transmitted through
5 the cavity and including one or more wavelengths which is
absorbed in use by a gas to be detected; and a detector for
detecting radiation which has passed through the cavity,
the walls of the cavity being sufficiently reflective to
the radiation that the cavity is substantially uniformly
10 illuminated with the radiation.
2. A gas sensor according to claim 1, wherein the detector
has a surface area which is visible to the interior of the
cavity, and the walls of the cavity are sufficiently
reflective to the radiation that the visible surface area
15 of the detector is illuminated with substantially
unfocussed radiation.
3. A gas sensor according to claim 2, wherein the entire
visible surface area of the detector is illuminated with
substantially unfocussed radiation.
- 20 4. A gas sensor according to claim 2 or claim 3 wherein
increasing the visible surface area of the detector
relative to the surface area of the cavity walls increases
the signal to noise ratio detected by the detector.
5. A gas sensor according to any of the preceding claims,
25 wherein the cavity comprises a first end wall adjacent to
which at least one of the means for generating radiation
and the detector is positioned, a second end wall which
opposes the first end wall, and a side wall; the first and
second end walls defining the height of the cavity between
30 them and the width of the cavity being defined as a maximum
dimension of the cavity orthogonal to its height, wherein
the ratio of the height to the width is greater than or
equal to 0.1.
6. A gas sensor according to any of claims 1 to 4, wherein
35 the cavity comprises a first end wall adjacent to which the
means for generating radiation and the detector are
positioned, a second end wall which opposes the first end

- wall, and a side wall; the width of the cavity being defined as the maximum dimension of the cavity along a line joining the means for generating radiation and the detector, and the height of the cavity being defined as the maximum dimension of the cavity in a direction orthogonal to its width, wherein the ratio of the height to the width is greater than or equal to 0.1.
7. A sensor according to claim 5 or claim 6, wherein the height to width ratio is greater than or equal to 0.2.
8. A sensor according to claim 7, wherein the height to width ratio is greater than or equal to 0.4.
9. A sensor according to claim 8, wherein the height to width ratio is greater than or equal to 0.5.
10. A sensor according to any one of claims 5 to 9, wherein the height to width ratio is less than or equal to 2.
11. A sensor according to claim 10 wherein the height to width ratio is less than or equal to 1.
12. A sensor according to claim 11 wherein the height to width ratio is less than or equal to 0.7.
13. A sensor according to any of the preceding claims, wherein the radiation generating means generates infra-red radiation.
14. A sensor according to claim 13, wherein the infra-red radiation generating means comprises a heating element to heat gas within the cavity so as to cause the gas to generate infra-red radiation.
15. A sensor according to any of claims 1 to 13, wherein the means for generating radiation comprises a filament bulb or LED(s).
16. A sensor according to any of the preceding claims, wherein the radiation generating means is located, at least partially, in the cavity.
17. A sensor according to any of the preceding claims, further comprising one or more additional radiation detectors, each detector being adapted to sense radiation centered on a respective, different wavelength.
18. A sensor according to any of the preceding claims,

wherein the radiation generating means and/or detector(s) is mounted on a printed circuit board and is surrounded by resilient protection.

19. A sensor according to claim 18, wherein the resilient
5 protection comprises a resilient member having one or more apertures through which the radiation generating means and/or respective detector(s) extends.

20. A sensor according to claim 19, wherein the radiation
10 generating means and/or respective detector(s) extends in a close fitting relationship through the aperture(s).

21. A sensor according to any of claims 18 to 20, wherein the pcb and the components mounted thereon are located in an electronics housing having an upper wall, the upper surface of which defines a wall of the cavity.

15 22. A sensor according to any of claims 19 to 21, wherein the resilient member and electronics housing have complementary keying features which interengage.

23. A sensor according to any of the preceding claims,
20 wherein the cavity wall defines a window allowing radiation to pass therethrough to the or a respective detector.

24. A sensor according to any of the preceding claims, wherein the cavity is substantially closed and has at least one aperture to allow passage of gas into and out of the cavity.

25 25. A sensor according to any of the preceding claims, wherein a majority, preferably more than 90%, of the cavity walls have a reflectivity to radiation exceeding 95%.

26. A sensor according to any of the preceding claims,
30 wherein at least a portion of the cavity walls are provided with a reflective coating.

27. A sensor according to claim 26, wherein the reflective coating comprises gold plating.

28. A sensor according to any of the preceding claims,
35 wherein the cavity walls are covered by a radiation transparent protective coating.

29. A sensor according to any of the preceding claims, wherein the cavity is tubular, for example cylindrical, and

has substantially planar end walls.

30. A sensor according to any of the preceding claims, wherein the cavity, means for generating radiation, and detector are located within an outer housing having at least one aperture to allow gas to enter.

31. A sensor according to claim 30, further comprising a flame arrestor within the outer housing.

32. A sensor according to claim 31, wherein the flame arrestor is secured to an outer surface of a housing having at least one aperture, the housing defining a wall of the cavity, by a flange which overlaps the flame arrestor whereby, when the cavity housing is assembled in the outer housing, the flange defines the thickness of a gas chamber communicating with the apertures in the outer and cavity housings.

33. A sensor according to any of claims 30 to 32, further comprising a memory such as an EEPROM, located within the outer housing for storing calibration data, the memory being coupled with electrical contacts such as pins accessible from outside the outer housing.

34. A method of constructing a gas sensor, the method comprising:

(a) inserting a tubular, optical housing, closed by a wall at one end except for at least one gas access aperture, into a tubular outer housing closed at its end adjacent the closed end of the optical housing, except for at least one gas access opening;

(b) inserting a radiation source and detector on a printed circuit board into a tubular electronics housing, the electronics housing having an end wall closed at one end except for one or more apertures to allow access to the source and detector;

(c) inserting the electronics housing into the outer housing so that it mates with the optical housing and defines therewith a substantially

closed optical cavity between the end walls of the electronics and optical housings and in which a gas to be sensed is located in use; and,

(d) securing the assembled housings together.

5 35. A method according to claim 34, wherein step d) comprises applying potting compound to the assembled housings.

36. A method according to claim 34 or claim 35 for manufacturing a sensor according to any of claims 1 to 33.